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BOTANY.[1]

Summer-School Botany in the Mountains.—It may be of interest to teachers of botany in schools and colleges to know what has been found possible to accomplish in a short course in the Colorado Summer School of Science, Philosophy and Languages the present year. The school was held in the city of Colorado Springs at the foot of Pike's Peak, within easy reach of the vegetation of the plains, the cañons, foot-hills, and the strictly alpine regions. The numerous brooks and mountain streams supplied an abundance of aquatic forms, while the damp cañons furnished all kinds of fungous growths. Lichens, mosses and ferns were found in abundance, so that every section of the vegetable kingdom was well represented. Good rooms for lecture and laboratory work were set aside in the High-School building. The following outline was followed, with slight variation:

THE STRUCTURE OF PLANTS.

I. (*a*)—Cells. Protoplasm. Nucleus. The formation of new cells. Chlorophyll. Starch. Crystals.

II. (*b*)—Tissues. Rudimentary tissues. Permanent tissues.

III. (*c*)—The Plant Skeleton. Epidermis. The Fleshy Tissues.

IV. (*d*)—The Plant-Body. Homologies and Analogies. Transformation of parts.

THE PHYSIOLOGY OF PLANTS.

V. (*a*)—Water in the plant as a whole; in the protoplasm; in the cell walls. Source of water; movement of water; evaporation of water. Plant food; the compounds used; how obtained; how transported in the plant. Starch-making (carbon-assimilation); other assimilations.

VI. (*b*)—Growth. Effects of Heat and Light on Plants. The sensibilities of plants. The movements of plants.

CLASSIFICATION AND DISTRIBUTION OF PLANTS.

VII. General laws of classification. Relationship. Distribution of plants in space and time.

THE LOWER WATER-PLANTS.

VIII. (*a*)—The simplest plants (Class 1, *Schizophyceæ*), Water Slimes, Nostocs, and Bacteria.

IX. (*b*)—The Green Algæ (Class 2, *Chlorophyceæ*), Green Slimes, Pond-scums, Green-felts, Confervas, and their near relatives.

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[1] Edited by Prof. C. E. Bessey, University of Nebraska, Lincoln, Nebraska.

X. (*c*)—The Brown Algæ (Class 3, *Phæophyceæ*), Simple Fruit-tangles (Class 4, *Coleochæteæ*), Red Seaweeds (Class 7, *Rhodophyceæ*) and Stoneworts (Class 8, *Charophyceæ*).

THE DEGENERATED PLANTS.

XI. (*a*)—The Sac-Fungi (Class 5, *Ascomycetes*) Mildews, Truffles, Cup-fungi, Black Fungi, Rusts and Smuts.

XII. (*b*)—The Higher Fungi (Class 6, *Basidiomycetes*), Puff-balls, Earth-stars, Bird's-nest Fungi, Mushrooms, Toadstools and Pore-fungi.

THE MOSSWORTS.

XIII. The Liverworts (Class 9, *Hepaticæ*) and the Mosses (Class 10, *Musci*). The undifferentiated plant-body; the Shoot with Stem and Leaves; Reproduction; Alternation of Generations.

THE FERNWORTS.

XIV. (*a*)—The Ferns (Class 11, *Filicinæ*). The prothallium; antherids and archegones; fertilization; growth of the embryo; the leafy plant; spore-cases and spores; germination of the spores. Alternation of generations. Classification of ferns.

XV. (*b*)—The Joint-rushes (Class 12, *Equisetinæ*). Comparison with ferns. The plant-body; spore-cases and spores. Extinct joint-rushes. The Lycopods (Class 13, *Lycopodiaceæ*). Comparisons with ferns and joint-rushes. The plant-body; spore-cases and spores. Extinct lycopods.

THE NAKED-SEEDED PLANTS (Class 14, *Gymnospermæ*).

XVI. Cycads, present and past; Conifers (pines, spruces, firs, etc.), structure of the flowers, fertilization, cones and seeds. Relationship of gymnosperms to lycopods.

THE COVERED-SEEDED PLANTS (Class 15, *Angiospermæ*).

XVII. (*a*)—The Flower (stamens, pistils, flower-leaves); fertilization; fruits; seeds.

XVIII. (*b*)—The lower group (Monocotyledons); water-plantains; lillies; aroids: palms; grasses; irises; orchids.

XVIII. (*c*)—The higher group (Dicotyledons).

XIX. (1)—Flowers with separate petals. Buttercups, mustards, pinks, mallows, geraniums, grapes, maples, roses, beans, myrtles, melons, cactuses and umbelworts.

XX. (2)—Flowers with united petals. Primroses, heaths, olives, gentians, phloxes, morning glories, figworts, mints, honeysuckles, bellworts and sunflowers.

The work was divided into an elementary and an advanced course, the former for those who took up the study of botany for the first time, and the latter for those who had already made some progress in the study. The attendance was large, considerably exceeding one hundred, and was composed almost entirely of teachers of maturer years, in all departments of school work, from the kindergarten to the high-school and academy.—CHARLES E. BESSEY.

VEGETABLE PHYSIOLOGY.[1]

Fischer on Bacteria.—Under the title Untersuchungen ueber Bakterien, Dr. Albert Fischer contributes an important paper to a recent number of Pringsheim's *Jahrbücher fur wissenschaftliche Botanik* (Bd. 27, H. 1, pp. 163, T. 5, Berlin, 1895). This paper consists of four parts: (1) New observations on the plasmolysis of bacteria; (2) The physiology of the flagella and of the movement; (3) The morphology of the flagella; (4) Classification. Of the five plates illustrating flagella, four are lithographic, and one is a collotype. The author appears to have made out pretty clearly for a good many forms that the contents of the bacterial cell is plasmolyzed even by a slight concentration of culture media such as takes place on the cover glass in drying or in the transfer of the organisms from a weaker to a more concentrated culture medium. This plasmolysis can be avoided by diluting the fluid very plentifully with water before making cover glass preparations from it. Only a very slight amount of sodium chloride is necessary to produce plasmolysis of a cover glass preparation, especially at the edge of the drop, viz.: 0.01 to 0.05 per cent. The occurrence of this phenomenon can be observed in a hanging drop as it dries. Plasmolysis disappears when watery stains are used, but is beautifully preserved by alcoholic stains, Ziehl's carbol fuchsin, or Delafield's haematoxylin. Many false conclusions have been drawn from such plasmolyzed bacteria. Here belong De Toni and Trevisan's genera *Pasteurella* and *Dicoccia*; the staining phenomena of the cholera vibrio, described by Rahmer; the bamboo-like joints sometimes seen in the anthrax bacillus; the polar bodies in the typhoid bacillus; the various granular structures in the tubercle bacillus, etc. The unstained, empty places

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[1] This department is edited by Erwin F. Smith, Department of Agriculture, Washington, D. C.